

Asteroid 1990 MB was discovered by D. H. Levy and H. E. Holt on 20 June 1990 during the course of the Mars and Earth-Crossing Asteroid and Comet Survey conducted by E. M. and C. S. Shoemaker. An orbit based on a 9-day arc and the asteroid's location near Mars' L5 (trailing Lagrangean) longitude led E. Bowell to speculate that it might be in 1:1 resonance with Mars, analogous to the Trojan asteroids of Jupiter. Subsequent observations strengthened the possibility (IAUC 5067), and later calculations by M. Yoshikawa and B. G. Marsden (IAUC 5075) confirmed it. Thus 1990 MB is the first known asteroid in 1:1 resonance with a planet other than Jupiter. Subsequently, E. Helin found images of the asteroid on plates taken in 1979 (*Minor Planet Circ.* No. 17333), allowing further orbit improvement. The most recent orbit, from the observations in 1979 and 1990, shows that the asteroid's semimajor axis (1.5235591 ± 0.0000003 AU, epoch 10 December 1991) is very similar to that of Mars (1.5235830 AU, same epoch).

The existence of 1990 MB--a small body most likely between 2 and 4 km in diameter--provides remarkable confirmation of computer simulations performed by S. Mikkola and K.A. Innanen (IAU Colloquium 123, in press). Their self-consistent n-body simulations have demonstrated just this sort of stability for Trojans of all the terrestrial planets over at least a 2-million-year time base. In the case of Mars Trojans, it was initially thought that stable-looking orbits must have semimajor axes that depart from Mars' by less than $da/a = 0.003$ and angular excursions from L5 that are less than 2 deg. Such a small region of stability led Bowell *et al.* (*Bull. Amer. Astron. Soc.* **22**, 1357, 1990) to speculate that 1990 MB was captured from a free orbit fairly late in solar system history, since it appeared unlikely to have survived the heavy bombardment known to have occurred in the region of the terrestrial planets. Additional evidence came from the existence of (3800) 1984 AB, an asteroid having a semimajor axis of 1.578 AU, which suggests that multiple encounters with Mars could lead to orbits rather close to the 1:1 resonance. However, more recent integrations of the motion of 1990 MB by Mikkola and Innanen show that stable excursions about L5 as large as 80° occur on timescales of millions of years. Thus, the question of whether 1990 MB is a primeval Mars Trojan remains open.

The discovery of 1990 MB suggests that others of similar or smaller diameter may be found. A systematic search of Mars' L4 and L5 libration regions is planned, as are more detailed studies of the regions of planetary Trojan stability.

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